NOTE

Make sure that the database you're replicating and its counterpart on the server both have either LocalDomain-Servers or the name of the specific server you're replicating with in their access control lists, with Manager access.

After Notes completes the replication process, the Replication Statistics dialog box appears. (It opens automatically after replication.) This dialog box displays details about the database documents and mail messages that are affected during database replication:

- **Additions:** Reports the number of new documents that are added (Sent) to the original database, or added (Received) to the database replica.
- **Deletions:** Reports the number of documents that are deleted (Sent) from the original database, or deleted (Received) from the database replica.
- **Updates:** Reports the number of documents that are changed (Sent) in the original database, or changed (Received) in the database replica.
- **Databases replicated:** Reports the number of databases that are replicated.
- **Databases initialized:** Reports the number of databases that are initialized.
- **Mail messages transferred:** Reports the number of Mail messages that are transferred from your Outgoing mailbox to your mail server.
- **Replication exception conditions logged:** Reports the number of possible error conditions that occurred during replication. Information about these conditions appear in your Notes log file (LOG.NSF).

Click on OK to close the dialog box and return to the Notes Workspace. If you didn't select the Hang up when done option in the Tools Replicate dialog box, you need to manually break the connection to the server. To end a modem connection to a Notes server, choose

Tools ➤ Hang Up. The Hang Up dialog box appears, as shown in Figure 10.10. Select the port you want to disconnect. Click on the Hangup button, or Cancel if you change your mind.

To check when and with which server a database last replicated, choose File ➤ Database ➤ Information. Click on the Replication button. Click on the View History button. The Replication History dialog box appears, as shown in Figure 10.11. You can do any of the following:

- To sort the information by date, select By Date.
- To sort the information by server, select By Server.
- To delete all history, select Clear. This option is useful if you think your replica doesn't contain all the documents it should or if time/date stamps are out of sync between your replica and others. This deletes the replication history for all servers which the server replicates.

Select Cancel to close the dialog box.

FIGURE 10.10

The Hang Up dialog box

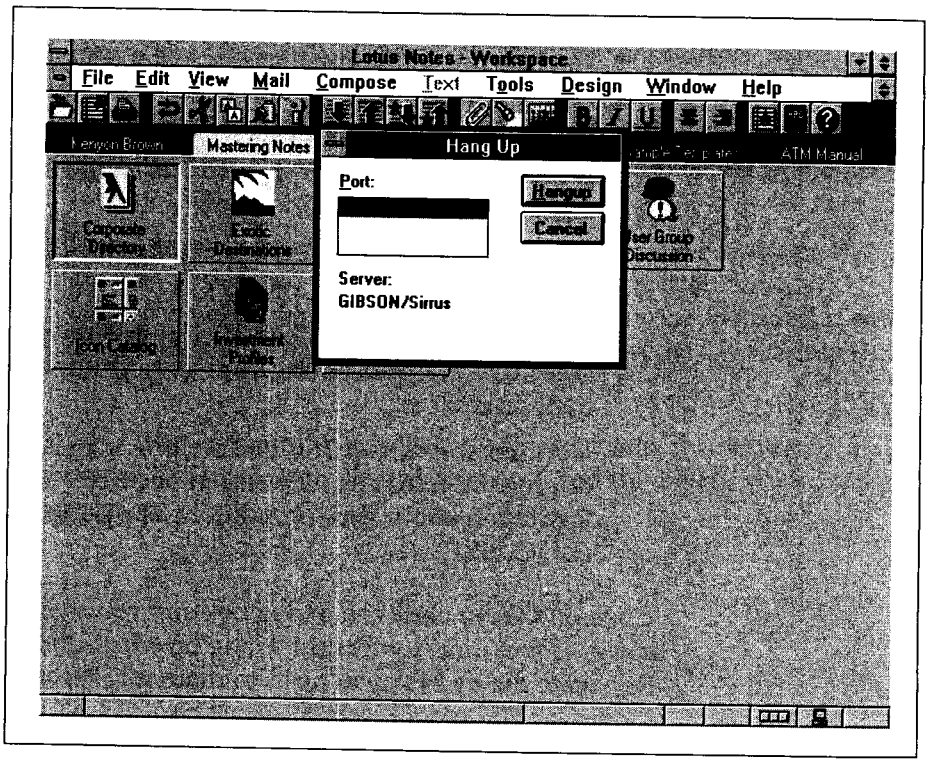
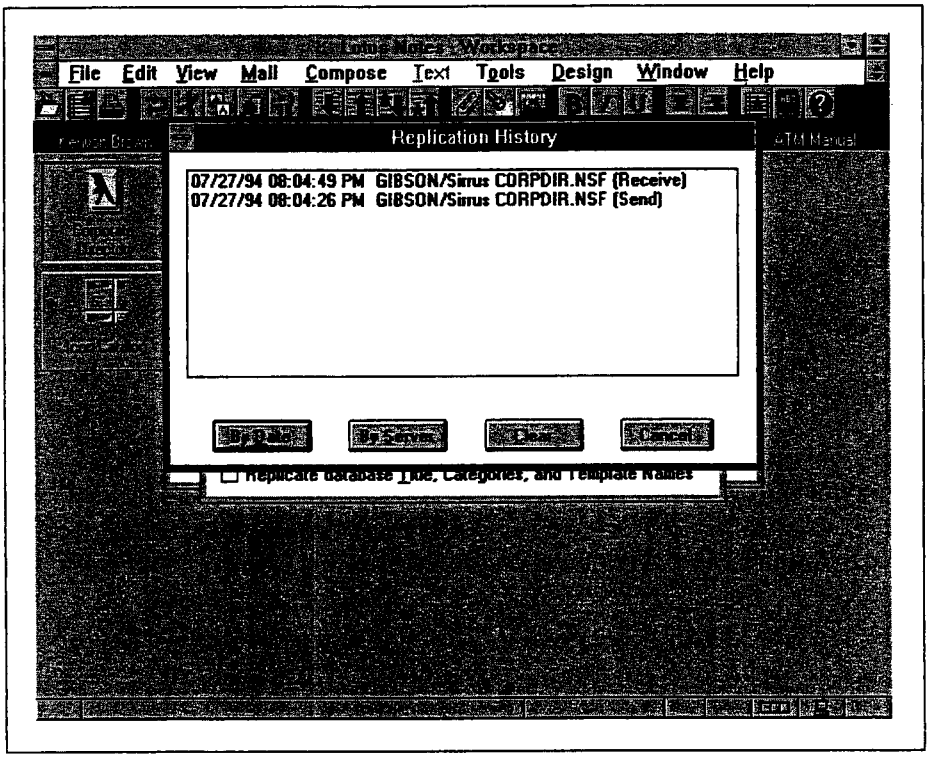


FIGURE 10.11

The Replication History dialog box enables you to check when and with which server a database last replicated.

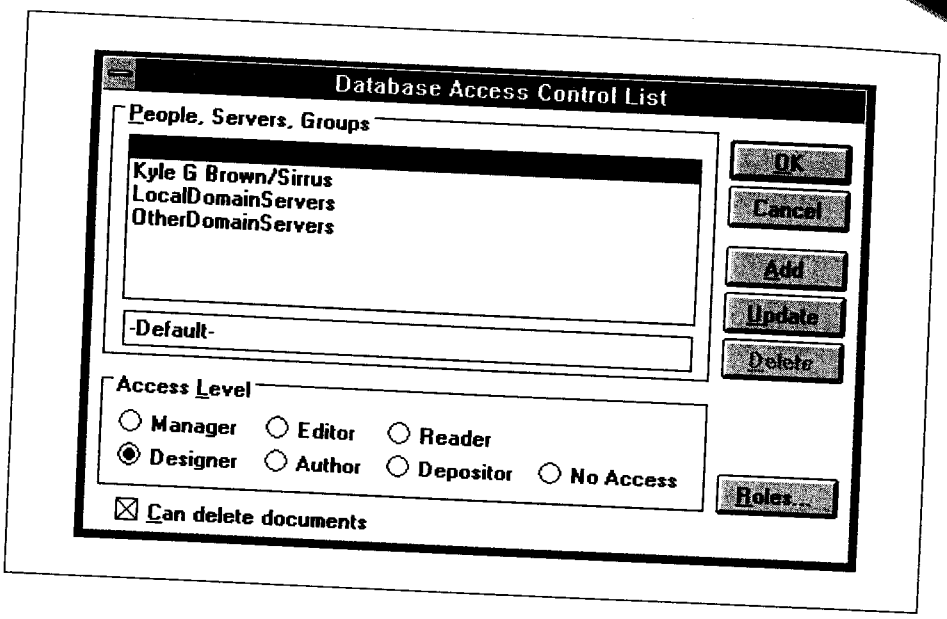


NOTE

If you clear the history, Notes will no longer have a record of when replication occurred last. The next replication will invoke a *full* search for documents to replicate, not just a normal (incremental) search. That means Notes will look at the "last modified time" for all documents in the source database and replicate any changes that the destination database doesn't have. Use this option only if you're sure it's needed; full replications create more network traffic and take longer than incremental replications.

FIGURE 18.1

The Database Access Control List dialog box details who can open the database and what they can do to its information.



In addition to designating access levels, however, Notes protects your work and the work of other users on shared databases in a variety of other ways:

- User IDs can be protected with passwords.
- Users are granted or denied access to Notes servers through the *certificates* stored in their User IDs.
- Information can be encrypted so that only specific users can decrypt it.
- If you're using Notes with a modem, you can use a secure modem channel by selecting Encrypt Network Data in the Port Setup dialog box.

▶▶ Using IDs

A User ID is a file that identifies a Notes user. Every Notes user—person or server—has a unique User ID. The terms User ID, ID, and ID file are used interchangeably in Notes. The contents of a User ID are either assigned by a certifier when the ID is created, or added later.

The following information is assigned:

- The name of the ID owner (which can be changed later by the owner or certifier)
- The Notes license number
- A certificate (which allows access to servers that trust the certifier)
- A public key (which is used to encrypt documents sent to the owner)
- A private key (which is used to decrypt documents sent to the owner)
- A password can be added to prevent unauthorized access to Notes servers using the ID (added by the owner)
- Additional certificates to allow access to additional servers (added by certifiers)

▶ Why You Need a User ID

When you try to open a database on a server, the server looks at your ID to see if you have any certificates in common. If you do, access is allowed; if you don't, access is denied. This checking process is called *authentication*, and it's the reason why it sometimes takes a few moments to access a server that you haven't used recently.

You also need a ID to sign Notes mail memos. When you sign a Notes mail memo and send it, all of your certificate(s) are attached to the memo. The recipient's workstation checks these against its own certificates.

If you receive a signed memo and you don't have a certificate in common with the sender, Notes displays a message saying that the authenticity of the memo cannot be assured. If you know that you and the sender have a certificate in common, the memo may have been tampered with en route.

To get information about your User ID, choose Tools ➤ User ID ➤ Information. You'll see the following information about your ID:

- File name and location
- Number

The Clear Password dialog box appears. If you want to *temporarily* log off Notes servers so that your password must be reentered to access them again, choose Tools ➤ User Logoff instead.

To clear your password, enter your password into the text box. Click on OK. Your password is cleared. To specify another password, choose Tools ➤ User ID ➤ Password ➤ Set and follow the same steps as above.

▸▸ Examining Your User ID Certificates

A *certificate* is an electronic "stamp" attached to your User ID by a Notes certifier. (The certifier is usually the Notes Administrator.) Certificates allow you access to specific Notes servers.

When you were registered as a Notes user, your User ID should have included the certificate(s) required to access the servers you need for your job. As you make wider use of Notes, your job changes, or your organization adds servers, you may need access to other servers. If you're denied access to them because you're not certified, ask the proper certifier for the certificate you need.

You can see information about the certificates that are attached to your User ID. The information provided about your certificates includes:

- The names of each certificate on your ID
- The date and time each one was created, and the date and time they expire
- The ID number and name of the certifier

To review the certificates that you already have, choose Tools ➤ User ID ➤ Certificates. If your ID file is password-protected, you must enter your password in the Enter Password dialog box. The Currently Held Certificates dialog box appears, as shown in Figure 18.6, which lists your current certificates. Select the certificate you want information on. You can delete a certificate by selecting it and clicking on Delete. Your Notes Administrator may also ask you to check your ID for hierarchical name information.

One of the most impressive features in Lotus Notes is a process known as *database replication*. Basically, replication is a procedure that updates and distributes copies of the same Notes database, known as *replicas*, which are stored on different servers. In this chapter, we discuss replication by explaining how to:

- Create a new database replica
- Update a replica
- Perform selective replications
- Track replication events
- Handle replication conflicts

Suppose there are two copies of an insurance policy database, one on a claims adjuster's notebook computer and the other back at the company's headquarters, which is used by her assistant. Yesterday the copies were identical, but today the claims adjuster investigated a house that was damaged by fire and an office building with burst water pipes. She subsequently wrote her reports and added them to the copy of the database on her notebook computer. Back at company headquarters, her assistant responded to telephone calls from the distraught policy holders and recorded the status of the calls in the copy of the database on her workstation.

The two copies of the database are now out of synch with each other because changes have been made to them separately. Both copies must now be resynchronized and made identical again through replication. Notes can handle this task automatically when the claims adjuster returns to her office. She replicates the copy of the database on her notebook computer with the insurance company's database.

Replication is a powerful tool because the process enables copies of the same database on different networks, located in different locations, or

even different time zones, to reflect changes and become identical over time. The servers connect to each other at scheduled intervals, and the databases replicate changes to documents, access control lists, and the design elements in forms and views.

▶▶ How Does Replication Work?

Replication makes all copies of a database essentially identical *over time*, which means they don't become exact copies instantly. The process is an ongoing one. If a user makes changes in one copy of a database, replication ensures that those changes are added to all copies, as long as the replication options are set up to do so. However, since many people can be using copies of the same database and updating the individual copies daily, making all of them identical at the same time is unlikely.

▶ Managing Replication

Replication takes time and requires specific Notes server resources. If you are developing a database for a multiserver environment, and you want to have the database replicated, work with the Notes Administrator to determine the replication schedule that makes the most sense for the system topology.

You can set up replication between servers, or between a workstation and a server for Dial-up users, which we discussed in Chapter 10. Both methods are similar.

▶▶ **NOTE**

Defining replication settings for a database requires Manager access; however, you only need Designer access to define the selective replication formula.

▶ Handling Frequent Document Updates

There are two types of replication you can consider for handling periodic document updates: *server-to-server replication* and *dial-up*

(workstation-to-server replication). Server-to-server replication occurs during scheduled server replication, or when the Notes Administrator manually forces replication. Replication for a local database on a workstation occurs when you perform a data exchange using the Tools ➤ Replicate command.

Dial-up (workstation-to-server) replication is handy if you use Notes on a LAN workstation as well as remotely. You can create a complete or partial database replica on your computer before leaving your office, save it to a floppy disk, and then copy it to your laptop or remote workstation once you are off-site or on the road.

▶ Scheduling Regular Replication

Replication is typically scheduled every few hours of a work day for Notes databases with time-sensitive information. This can be crucial for organizations whose databases are accessed and modified by many people. For databases that aren't modified as often or where the information isn't critical, replication can be conducted once a day. When a database is replicated over telephone lines between distant sites, replication might be scheduled once or twice a week and during the evening hours when long distance rates are lower.

▶▶ **NOTE**

Your organization's Notes Administrator is the person responsible for setting up and scheduling replication of databases. If you work off-site or on the road and you use Dial-up Notes, you should find out from the Notes Administrator when the best time is to replicate.

▶ Monitoring Database Replication

If you're a Dial-up Notes user who is using Notes off-site, replication keeps your workstation copy of a database current with the database on the server. However, the process isn't fool-proof and isn't without its problems, especially when you're using telephone lines. You should always monitor the process once databases begin replicating to make sure they continue to replicate as you want them to. The message area on the Status Bar at the bottom of your Workspace displays all activity

during the replication process. If a problem or conflict should occur, such as the sudden interruption of a telephone call that results in stopping replication, Notes will notify you.

NOTE

When you work off-site, it's useful to schedule server calls shortly before you begin working. This way you'll see the latest information in your local database replicas when you begin working—and again after you're done—so you can upload information to shared databases and use it when you send Notes mail. (Remember from Chapter 10 that the process of replication can run in the background, allowing you to continue working on other tasks on your remote machine.)

▶▶ Creating a Replica of a Database to a Workstation

A replica is a copy of a shared database that you store either on a server or on your workstation. It can be displayed in your Notes Workspace just like the source database. Before you can use the database exchange feature of Dial-up Notes, you must first create local replicas of the shared databases you want to use. Creating local database replicas lets you use databases without being connected to a Notes server using a LAN (local area network) or telephone lines.

You can create a partial or full replica of any shared database. A partial replica contains a subset of the documents in the source database, based on selection criteria you specify in the Selective Replication dialog box. A full replica contains all the documents that exist in the source database at the time the replica is made.

NOTE

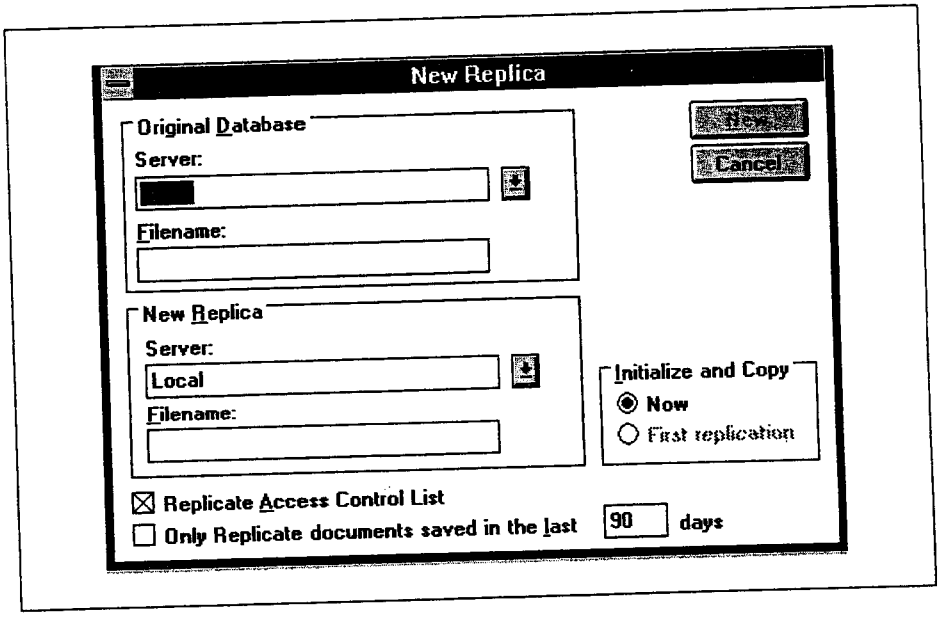
You must know the name of the server and the file name of the database you want to replicate before you attempt replication.

To update a database replica with information from the source database (and to update the shared database with information that you create locally), you perform replication, also known as *database exchange*. To do this, you can use a Remote Connection document or call the server directly using the Call Server dialog box. To create a new replica of a database, follow these steps:

1. Choose File ➤ New Replica. The New Replica dialog box appears, as shown in Figure 19.1.
2. Choose the server where the database you want to copy is stored. Notes fills this box in for you if you selected the database on your Workspace before you chose File ➤ New Replica.
3. Enter a name in the Filename text box, if Notes hasn't filled it in for you.

FIGURE 19.1

The New Replica Dialog Box lets you create a new replica of a selected database.



4. Choose the server where your new replica will be stored in the New Replica, Server text box. Choose Local to store it on your hard disk or a floppy disk.
5. Type a name in the Filename text box (up to eight characters) for the new replica. Notes adds the .NSF extension for you.
6. You have the option to copy the Replicate Access Control List (ACL). This is selected by default. You can also select the Only replicate documents saved in the last 90 days option, which fills the new replica with those documents created in the 90 day time period. This is the default time period. Or you can specify a different time period. This option is especially useful for Dial-up Notes users who create smaller versions of shared databases to use on a laptop workstation.
7. Select one of the options under Initialize and Copy. The Now option fills the replica with documents as soon as you select New. The First replication fills the replica with documents at the first scheduled or forced replication. Until that time, the replica is called a "replica stub" because it consists only of a blank database icon and the Notes ID you were assigned. (There is no design or any documents.) If you're making a replica copy on a floppy disk to bring home, use this option because it guarantees that the replica will fit on the disk.
8. Click on New to create the new replica.

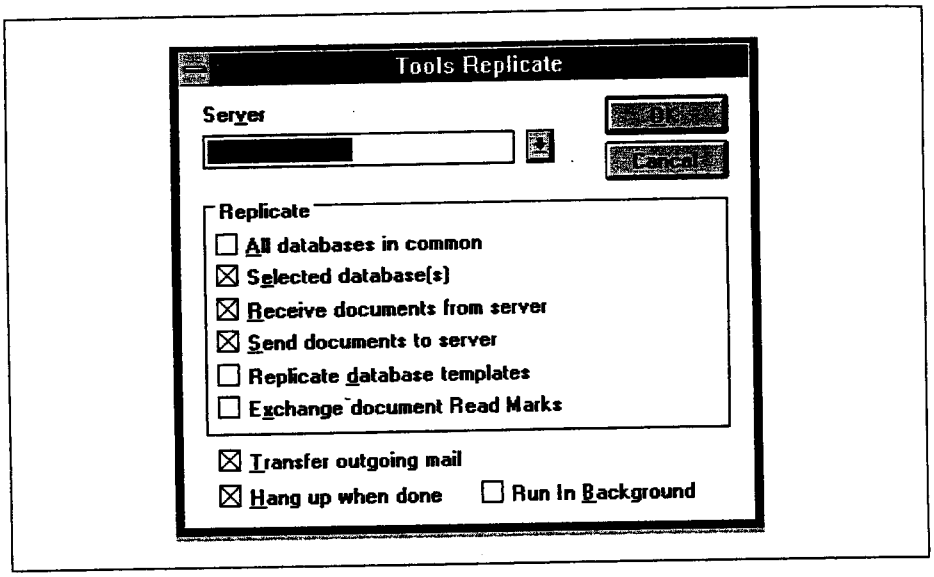
▶ Updating a Replica

Now that you've created a replica of a database on your workstation, you can update it at regular intervals, providing that you have access to the server and to the database. To update the replica, follow these steps:

1. Click on the database's icon in your Workspace to select it, or you can open it.
2. Choose Tools ➤ Replicate.
3. Enter your password, if one has been created. The Tools Replicate dialog box appears, as shown in Figure 19.2.
4. Enter or select the server if necessary (any server that contains a replica of the database will do).

FIGURE 19.2 ▶

The Tools Replicate dialog box lets you set replication options for replicating a selected database.



5. Select the desired Replicate options from the list. Typically, you would choose the Selected database(s), Receive documents from server, and Send documents to server options.
6. Select the Transfer outgoing mail and Hang up when done options. The first option sends mail but doesn't replicate your entire mail database, and the second option ends the telephone connection when replication is complete. The Run In Background options allows you to continue to work while replication is proceeding in the background.
7. Click on OK to begin replication.

▶▶ **TIP**

The length of time for replicating a database depends of the number of changes that have been made. Sometimes the procedure can take quite a while. So a word to the wise: If you need to replicate long distance, do it in the evening when telephone rates are lower. (Also, read on to find out how you can restrict the number of changes that are replicated.)

▶ Replicating Selective Information

There are two approaches for handling selective replication: *local* selective replication and *global* selective replication. The local approach is useful for a database that is locally administered at each site and would be appropriate for smaller sites, individual departments, and dial-up users. For example, if space on your workstation or laptop is limited and you want your replica to receive only certain types of information from the source database, this approach would be suitable. By replicating only part of the source database, you can also save the time and expense of long remote replication times. However, you must have Designer or Manager access to create formulas for selective replication of a database.

▶▶ **TIP**

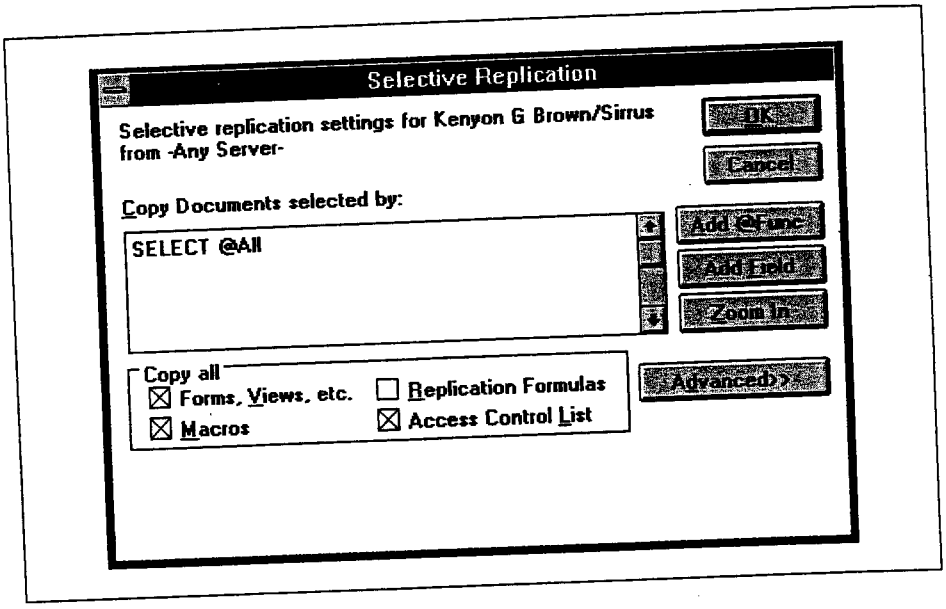
Selection formulas for replication are the same as selection formulas for views, which we discussed in Chapter 15.

To specify what documents a replica will receive when replicating a particular database directly, follow the steps below. You define a replication formula only for the current database that's been selected; this formula affects what gets copied into the current database whenever its server is the destination server during replication:

1. Click on the database's icon to select it.
2. Choose File ➤ Database ➤ Information. The Database Information dialog box appears.
3. Click on the Replication button. The Replication Settings dialog box appears.
4. Click on the Selective button. The Selective Replication dialog box appears, as shown in Figure 19.3.
5. In the Copy Documents selected by text box, write a formula to select which documents will replicate from the source to the destination. The default formula **SELECT @All** selects all documents from the source. Notes adds the word SELECT to all selection

FIGURE 19.3

The Selective Replication dialog box enables you to replicate only certain types of information from the source database.



formulas when they are saved, so you don't have to type it. You can choose these options:

- Click the Add @Func button to display a list of available @functions that you can paste into the formula.
- Click the Add Field button to display a list of all the fields from all the forms in the database that you can use in the formula.
- Click on the Zoom In button to enlarge the editing area when you're writing a formula.

6. Select any of the following options:

- Forms, Views, etc. to copy the high-level design elements, i.e., all forms, views, and shared fields.
- Macros to copy all macros.
- Replication Formulas to copy any replication formulas created at the source database. This is useful for a centrally administered database where a database manager sets up replication formulas for all other servers.
- Access Control List to copy the ACL.

7. Click on OK to save the replication criteria. This information will be saved with the database and will not appear in other replicas of the database unless the managers have chosen to replicate replication formulas.

WARNING

The @IsResponseDoc function will replicate *all* response documents, even those whose main (parent) documents are not selected by the formula. These orphaned response documents will not show up in any hierarchi-cal views.

For centralized database management, where an organization supports more than one site, global selective replication is a more useful approach. The current database is managed and maintained at a central location. You define the replication formula for the current database, in addition to one or more replicas at the different sites. In this way, you can control how they replicate even when they're not replicating directly with the current database.

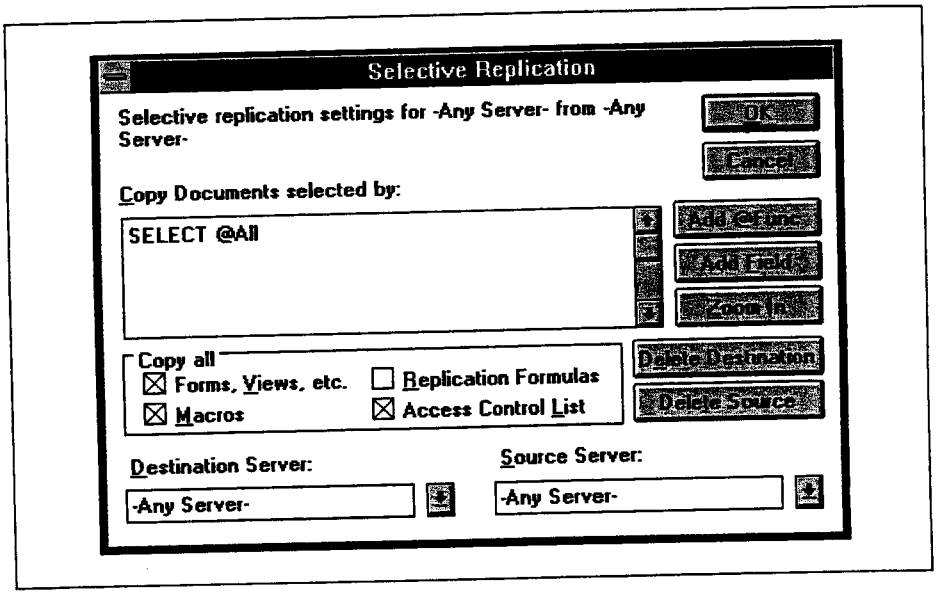
A database manager sets up selective replication on a master database that replicates to other servers. Replicas receive those documents that the database manager determines are suitable to each individual site. The main advantage to this approach is that the database manager knows what each site is receiving and can control and predict the costs for dial-up connections to remote sites. Selective replication also saves disk space at each site, since they don't need to store the entire database.

To set up selective replication for all replicas of a particular database, you would follow the same steps as above. When the Selective Replication dialog box appears, click on the Advanced button. The Selective Replication dialog box now displays a list of Destination and Source servers at the bottom, as shown in Figure 19.4. You can define a replication formula for each combination of servers that replicate the current database. Follow these steps:

1. Create a formula that selects which documents will replicate.
2. Choose to copy forms, views, etc., macros, replication formulas, or the access control list from the source database. (If you want all

FIGURE 19.4 ▶

The Selective Replication dialog box displays a list of Destination and Source servers when you click on the Advanced button.



the replicas to use the same replication formulas, select Replication Formulas.)

3. Enter the specific server's name, or accept the default of -Any Server- from the Destination Server list box. This identifies the server that will receive the updates. The new name will stay as a choice in the list box, unless you remove it by selecting Delete Destination.
4. Enter the new name or accept the default name -Any Server- from the Source Server list box. The default name means that the criteria you specify will hold when replicating from any server. The new name you enter will identify what server the database originates from. This name will stay as a choice in the From box, unless you remove it by selecting Delete Source.
5. Change the criteria for different servers by changing the formula for each Destination Server and Source Server combination.
6. Click on OK to save the replication criteria.

The information will be saved in other replicas of the database unless the managers have chosen to replicate the replication formula.

▶▶ Handling Replication Conflicts

Database replicas aren't identical at all times. As we have mentioned, servers connect to other servers to update the replicas on a scheduled basis. Sometimes two users might edit the same document between data exchanges, resulting in simultaneous updates. The replicas contain different information until the next time the servers replicate. You might open multiple copies of a document yourself, edit one or more of them, and then close and save each version of the document. In any case, there would be different replicas of the database.

Notes handles the situation by maintaining a revision history of each document. During replication, Notes updates the revision history and detects the concurrent updates. At this point, Notes designates the update with the most changes as the main (original) document, or the "winner." The other revised documents are considered response documents, or "losers." (In case of a tie, the most recent update wins.) A view marks each response document with a diamond-shaped symbol in the left column and displays each one on a separate line, indented below the main document. The losers are considered "conflicting" documents and are labeled with **[Replication or Save Conflict]**. Users can see immediately that a conflict has occurred and must be resolved.

If a document is edited in one replica and deleted in another, the deletion takes precedence. The database designer can exclude conflicting documents from a view by adding the following to the view's selection formula (see Chapter 15 for more information):

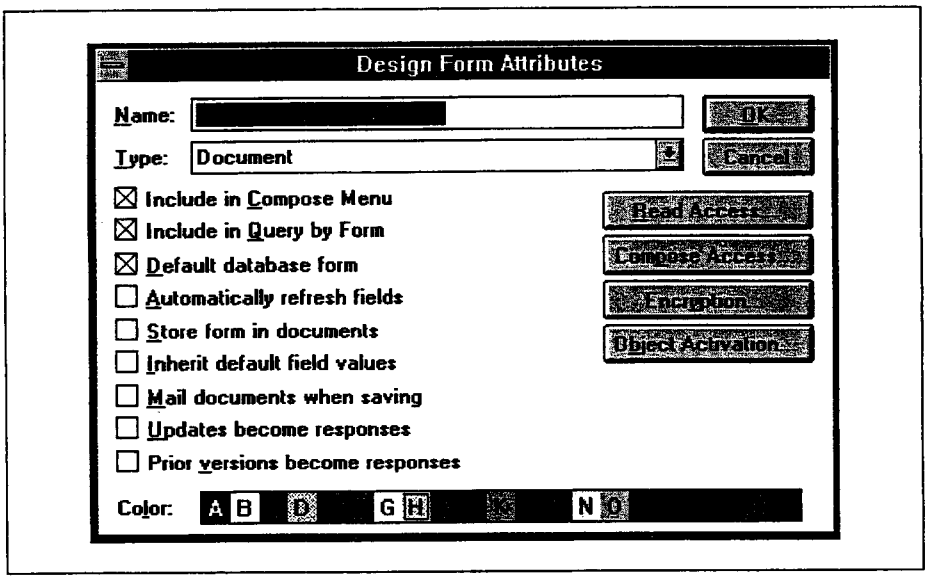
```
& !@IsAvailable($Conflict)
```

You might wonder what you can do about simultaneous updates when you want to delete the losers but save their information. You can compare all versions of the document to see if the responses (losers) contain any information that you want to add to the winning document. If they do, copy the information and paste it into the winning document. Then delete the losers.

What if you want to delete the winner and make a loser the saved document or new winner? You would open the loser you want to use, switch to Edit mode, then save the document. This would remove the document's conflict status, remove the black diamond, and promote it to

FIGURE 19.5

The Design Form Attributes dialog box lets you choose either the Updates become responses option or the Prior versions become responses option to prevent replication conflicts.



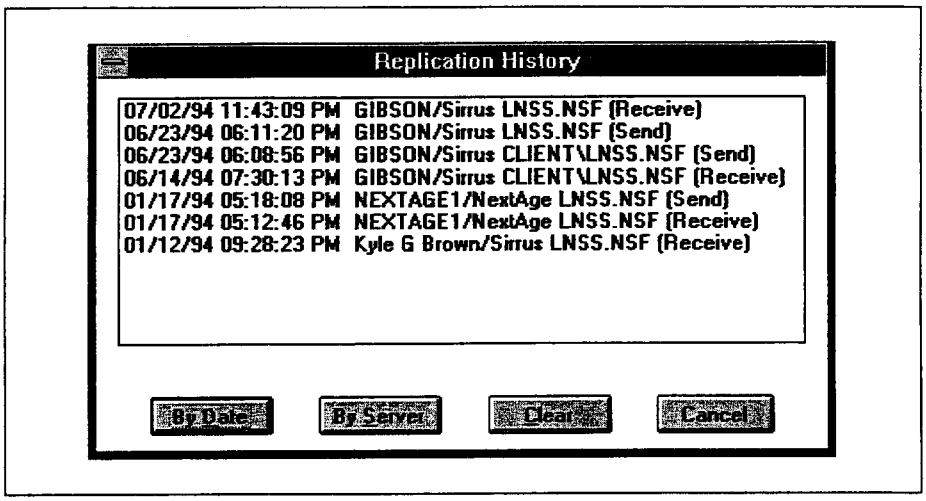
Keeping Track of Previous Replications

One of the most useful features of replication is how Notes tracks each replication event for each database. By tracking the events, Notes creates a replication history of a database. Notes determines which documents to replicate the next time it does so with the same server on the basis of the dates it records. This information can be useful for reviewing replication events and troubleshooting problems. To review the replication history of a database, follow these steps:

1. Click on the database's icon to select it.
2. Choose File ➤ Database ➤ Information. The Database Information dialog box appears.
3. Click on the Replication button. The Replication Settings dialog box appears.
4. Click on the View History button. The Replication History dialog box appears, as shown in Figure 19.6. The replication history reflects the date and time of the last replication, the server with which the database replicated, and whether documents were sent or received, or both.

FIGURE 19.6 ▶

The Replication History dialog box displays the date and time of the last replication, the server with which the database replicated, and whether documents were sent or received, or both.



▶▶ **TIP**

When you experience replication problems (and you probably will), you can manually clear a database's history and start over with a clean slate. Just click on the Clear button in the Replication History dialog box. This forces Notes to replicate all the documents that have changed since the database was created, not just those documents that have been modified since the last replication.

5. Click on the By date or By Server button to display information in either of these ways.
6. Click on Cancel to close the dialog box.

Notes will update the replication history of a database only if the replication has been successful. If the replication fails, no history will be recorded. Notes will try to replicate the same changes during the next replication.

As we discussed earlier, Notes compares the date of the last replication with the date when each document was last modified. In this way, Notes includes or excludes a document from the next replication. If a document contains changes that occurred since the last replication, the

document will be included in the next replication. If the document hasn't been modified since the last replication, Notes will exclude it from the next replication. Thus, Notes doesn't take any more time than it needs to complete replication. With large databases that contain hundreds of documents, a lot of time can be saved. Otherwise, replicating would be an inefficient process.

To see a document's last modification date, follow these steps:

1. Select a database.
2. Open a view.
3. Select or open a document.
4. Choose Design ➤ Document Info. The Design Document Info dialog box appears, as shown in Figure 19.7. It displays the date of the last modification, in addition to other pertinent information.
5. Click on OK to close the dialog box.

You can also view your Notes Log database that's located in your Workspace to see additional replication information. Select the database and choose the Replication Events view from the View menu. The view is shown in Figure 19.8. When you double-click one of the replication events in the view, a Replication Log Entry document appears, as

FIGURE 19.7 ▶

The Design Document Info dialog box displays the date of the last modification, in addition to other pertinent field and database information.

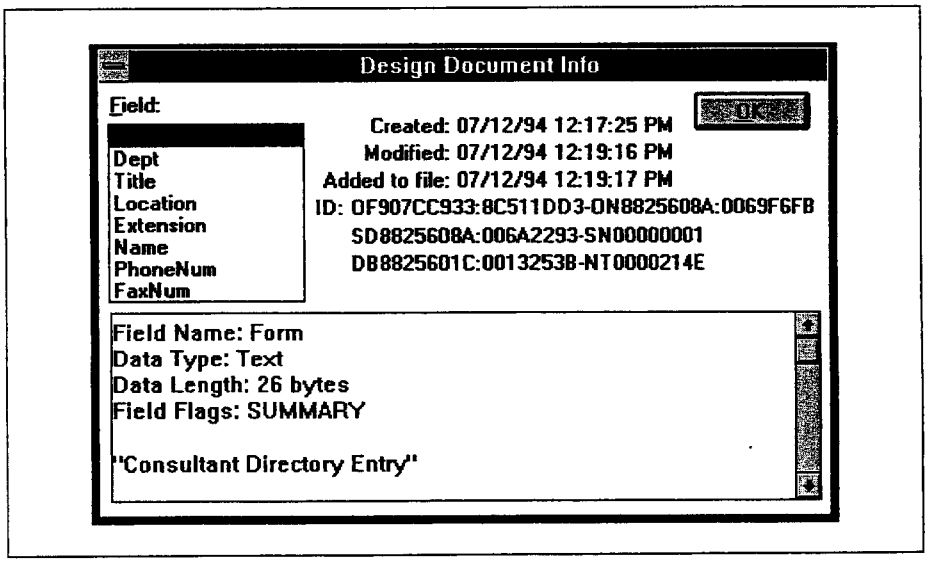
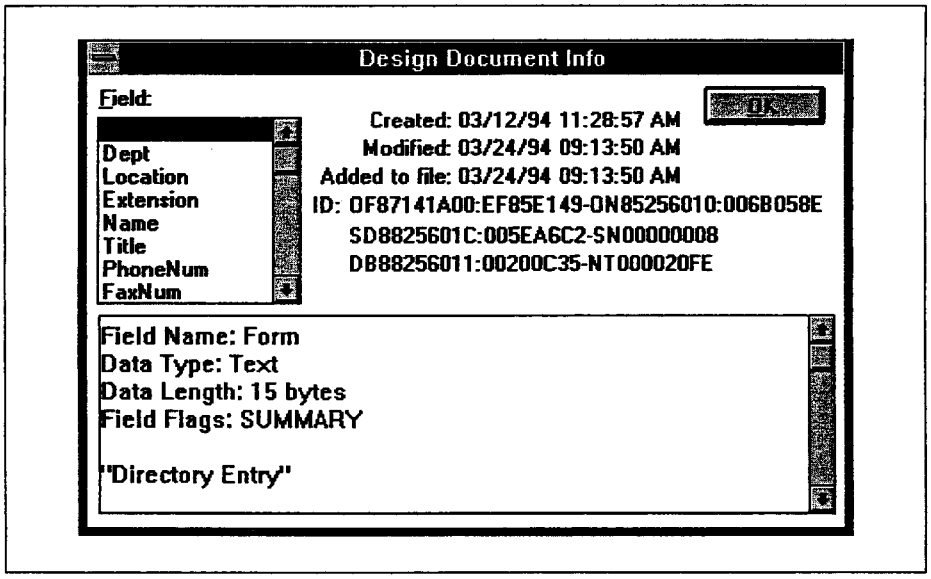


FIGURE 22.9 ▶

The Design Document Info dialog box displays document statistics and field data information.



▶▶ **NOTE**

Some internal fields that are displayed in this dialog box are not readable because of the manner in which the information is stored. In addition, if a field has been encrypted and you do not have the appropriate encryption key, you will not be able to see the field's contents in the Design Document Info dialog box.

3. Select a field from the list displayed in the upper left corner of the dialog box. The field's contents are displayed in the box below the list.
4. Select another field to see its contents.
5. Click on OK to close the dialog box.

▶▶ Compacting a Database

Compacting a database means removing the unused space—known as "white space"—that is left by deleted documents. Removing the